Remarks:

Claim Objections

Claims 2 was objected to for stating "a n+ region". This was amended as suggested to read "an n+ region".

Claim Rejections – 35 USC 112

Claims 2-4 and 6 were rejected under 35 USC 112 for failing to comply with the written description requirement on the basis that there is no support for the limitation of forming at least one p+ region and at least one additional n+ region inside ~~a~~ the p-well of the structure to define at least one p-n junction between the at least one p+ region and the at least one additional n+ region in the p-well, as claimed in claim 2.

The page and line references will be made to the replacement specification filed with the response that was mailed 9/11/2002 in response to the Office action of 8/12/2002. However, other than the corrections mentioned in that response (corrections to the Field of the Invention line 1, and page 6, line 31 and the adding of the units on page 6, line 31, the content remained the same as at time of filing.

The examiner is referred to Figure 4 of the application and page 8, line 28 – page 9, line 4 which discusses the various p+ and n+ regions, the diodes that they define and the resultant p-n junctions. Thus the inventors clearly had possession of the invention at time of filing.

The examiner states that the at least one p+ region and at least one additional n+ region are separated by an isolation region. As described on page 9, lines 1-4 the first p+ region 420 and first n+ region 422 are not isolated – both are formed in a common p-well 402. Charge carriers can freely pass between regions 420 and 422 through the p-well 402. For the oxide region between the p+ region 420 and n+ region 422 to isolate the two regions it would have to extend downward to an isolation layer, which it does not.

The examiner also states that there is no support for the at least one n+ region and at least one p+ region formed in the p-well being forward biased during normal operation as recited in claim 3.

The examiner is referred to page 5, lines 36-39, which describes the p+ and n+ regions in the p-well 402 and specifies that the p+ region 420 is the anode, while the n+ region 422 is the cathode. Thus the p+ region is at the higher potential relative to the n+ region and is forward biased. Furthermore, as can be seen in Figure 4, the p+ region 420 is on the right hand side, which is the anode side or high voltage side of the LVTSCR structure (In an LVTSCR the n-well side i.e., the side with the n+drain 406 and p+ emitter/drain 408, is always the anode side). Thus, during normal operation the diodes of the invention that are formed in the p-well 402 are forward biased.

This is further made clear by page 6, lines 3-5 which discusses that before breakdown of the LVTSCR (normal operation) when current is low, the threshold voltage of the diodes is not yet reached. At higher currents (page 6, lines 12-14) the diodes conduct and provide approximately a 1V drop each. Thus clearly the diodes are forward biased since they operate according to their normal operating regimen, with a threshold voltage of about 1V.

Thus it is respectfully submitted that the entire premise of the invention, namely forming diodes in the p-well by means of forwardly biased p-n junctions, is discussed in detail in the specification.

For clarification, claims 2 and 3 have been amended to make it clear that a typical LVTSCR includes a p+ region and an n+ region in the p-well, and that the present invention adds at least one additional n+ region and at least one additional p+ region to the p-well to define a forward biased diode (i.e., it cannot be short circuited), between one of the p+ regions and one of the n+ regions (e.g. between p+ region 420 and n+ region 422).

Claim Rejections – 35 USC 102

Claims 2-4 and 6 were rejected under 35 USC 102 over Ker.

The examiner refers to Figure 3a of Ker and states that the at least one highly doped n+region and at least one highly doped p+region formed in the p-material of the p-well is forward biased

relative to each other during normal operation. However Figure 3a shows only the n+ and p+ regions that form the cathode in the p-well and are commonly found in LVTSCRs. It does not show additional n+ and p+ regions. Also, since the n+ and p+ regions of Figure 3a are connected together to define the cathode, the regions cannot be forward biased.
Figure 4a shows an additional p+ region but does not show additional n+ and p+ regions as required by the claims.

Claim 6 has been canceled.

In light of the above distinctions, it is respectfully submitted that the claims are distinguishable over Ker. Allowance of the claims is therefore requested.

Respectfully Submitted,

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